

Biostimulant market taking off

The biostimulant market is growing fast. Find out what they can do for plants



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Five or six years ago few people had heard of biostimulants, which were only being used in some high-value, horticultural crops. Today, the biostimulant market is one of the fastest growing, global agri-input sectors, increasing by 12 to 15 per cent annually.

“Biostimulants is a rapidly growing field right now in agriculture, largely because these molecules or compounds or organisms that are naturally found within the agro-ecological system appear to have lots of benefits for plant health,” says Mark Belmonte, who is doing genetic research into biostimulants at the University of Manitoba.

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Biostimulants are natural micro-organisms and nutrients derived from all kinds of different natural substances. They stimulate plants’ natural biological processes to help them cope with stress and allow them to reach their maximum genetic potential in terms of yield and quality.

Helping plants cope with stress

Stress is the number one cause of yield loss. “When you put the seed in the ground, whether it’s a canola, wheat or soybean seed you are currently only extracting about 10 to 15 per cent of the potential yield,” says Kip Workman, sales and technical manager for Stoller Enterprises, an international manufacturer and distributor of biostimulant products with an office in Regina, Sask. “As the stresses start to eat away at that seed, whether it’s cold soils or not enough light, or not enough water the yield potential for the seed keeps going down. What we’re trying to do with biostimulants is extract more of that potential out of the seed by reducing the effects of the stresses that it’s under.”

The term “biostimulant” is fairly new, although these types of natural inputs have been used for hundreds of years by farmers and horticulturalists. We’re just beginning to understand their basic mechanisms. Biostimulants are a huge area of research, says Balakrishnan Prithiviraj, associate professor at the Department of Environmental Sciences at Dalhousie University.

“A biostimulant changes the physiology of the plant in a way that makes it more resilient to abiotic stresses such as water, heat, drought and salinity,” says Prithiviraj. “It acts as a priming agent for the plant so that when there’s stress, the plant that is treated with the biostimulant is much more responsive and tolerant to these stresses. It’s a complex product and I think that is a benefit because it is able to elicit quite a number of different properties in the plant that makes it more useful for the plant, rather than having one chemical which affects only a specific pathway and is thereby effective only against a specific stress or property.”

How biostimulants work

Belmonte and his team at the University of Manitoba are doing genetic research in canola using natural, plant-derived biostimulants, with the aim of determining what mode of action they have. “By understanding the mode of action of these biostimulants, we can better understand how the plant is responding to these additives,” says Belmonte.

They’ve found that applying biostimulants on canola increases growth in the root system and provides increased plant vigour, so plants are much better able to withstand adverse environmental conditions and disease.

Plants have hormones too

Workman had never heard anything about plant hormones when he went through the agriculture program at university. It wasn’t until he began marketing biostimulants that he realised there is a huge lack of information about this area of plant science.

Plants have hormones just like humans, and in times of stress they produce stress hormones instead of growth hormones. Stoller’s flagship biostimulant product, Bio-Forge tricks the plant into thinking it’s not stressed, says Workman. “If the plant believes it’s not stressed, it goes back to producing growth hormones,” he says. “Then we have a product called Stimulate, which is a combination of

auxin, cytokinin and gibberellin acid. Those are the three main plant growth hormones, so that's a supplementation of growth hormones the plant would be producing on its own already. It's essentially the equivalent to human growth hormones for plants."

Belmonte's team has also discovered that certain biostimulants increase plants' photosynthetic capacity. "Depending on the biostimulant, we see greener, darker plants, which are more vibrant," says Belmonte. "Not only were the genes that are associated with photosynthesis increased within the leaves, but we also saw a corresponding increase in photosynthetic rates, which, of course, leads to increased plant production."

There are many categories of biostimulants, including metabolites and microbes, botanical extracts from plants like seaweed, amino acids, proteins and cytokinins, which makes them hard to regulate. Because there is concern about the flood of products claim to be biostimulants, international regulators, including the U.S. Environmental Protection Agency are consulting with scientists around the world to try and draw up legislation to regulate the registration of biostimulants. It's not an easy task. "Regulators will have a hard time because of the complex nature of the product," says Prithiviraj. "Biostimulants have thousands of different compounds in them and it becomes difficult to quantify those chemicals."

What's the price?

There is a perception that biostimulants are expensive, but Workman says an application of Bio-Forge, depending on the commodity, is \$2 to \$5 an acre. He recommends that growers begin with a seed treatment. "One of the main stresses that we have in Western Canada is at seeding. Either it's too hot, too dry, too wet or too cold, so Bio-Forge applied on the seed helps to help mitigate some of those early season stresses and help that plant get up out of the ground quicker and develop a root system quicker," says Workman. "That's where we see a lot of the best benefits because it widens yield potential early on. The quicker we can get that plant up and out of the ground, the sooner it'll start producing its own energy so there's more yield potential there if we can get a healthy start for those plants."

Biostimulants can also be foliar applied, can be mixed in the tank with herbicides or fungicides so the grower can make one pass over the field, and are designed to be complimentary to these traditional inputs and help them work better.

The market for biostimulants is growing fast, and more and more farmers are using them on field crops such as wheat, barley, canola, soybeans and corn. "Biostimulants hold great promise from the results that we have seen with increased germination and crop establishment in wheat and barley," says Prithiviraj, who has done research using a biostimulant derived from seaweed extract in cereals and canola. "What we discovered was that the biostimulant increases the amylase production (required for germination) in the seeds and metabolizes starch much faster leading to faster establishment and healthy seedlings."

The proof is in the ground

Because there hasn't been a lot of information or research until recently about plant hormones or how biostimulants work, Workman says a huge part of his job is educating growers. That involves a lot of patience because biostimulants aren't a one-shot wonder solution to increase crop yields, but rather a long-term program that shows results over time.

"A single application of 250 ml/acre is not going to save your crop and give you the crop of a lifetime. It's a systems approach program," says Workman. "It's not a standard program for each crop. It's not going to be a standard year, the weather is different each year and from field to field. We have to make recommendations based on what's happening in that field at that time and it takes a long time to educate dealers and growers on the technology."

Workman says the easiest way to prove to growers that biostimulants work is to have them try it on plants that have physical damage from something like hail or herbicide injury. "If you can smell something like fresh cut grass after hail, that is the stress hormone ethylene escaping from the plant," says Workman. "When we spray the Bio-Forge on you can start to see the repair the next day. The plant will start setting new buds and sending out new branches and that's what convinces growers."

Options for growers

"Biostimulants do not replace other inputs, but they make them work better," says Prithiviraj. "They are like an insurance policy. When there's a stress, plants that are not treated with biostimulants are going to feel the brunt, but those that are treated — they're going to be safer and produce better yields. Heat stress is a big issue right now across the Prairie provinces and biostimulants can be a game changer. I see great potential and believe these products are going to have a greater impact not only on high-value crops but also in field crops in the near future."

Getting a better understanding of the different biological process than biostimulants can affect in plants will eventually provide more options for growers in terms of the formulations of biostimulants and the prescriptions for using them.

“I think we’re going to be able to make much better predictions as to when these products need to be applied, how much of the product should be applied, and what the expected results would be on the cropping system,” says Belmonte. “It’s providing growers with a non-traditional option for crop production and crop protection. Today’s growers love information and they want to know as much as possible about their farming system works and to have this type of tool in their toolbox adds a lot value. So, the grower can make a much more informed decision as to the type of product that they want to apply onto their field and how that would affect their soil health over time.”

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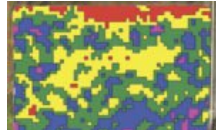
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Saskatchewan grain farmer, Sean Edwards first tried biostimulants on his crops about five years ago. He wanted to grow healthier plants with less fertilizer and reduce his fungicide use. "We were fairly wet and we had a lot of sclerotinia on our canola and fusarium on our cereals, and root rot in our peas was bad," says Edwards.

He began by applying a biostimulant product called Bio-Forge, manufactured by Stoller Enterprises Ltd, as a seed treatment. "It worked well, we had healthier plants and we didn't have the disease that we had before."

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Edwards, who farms 5,000 acres of cereals, oilseeds and pulses at Nokomis, Saskatchewan now says he doesn't even spray for sclerotinia on canola any more.

Soil health and root structure

He's also noticed improved soil health and root structure. "We are noticing overall root structure improvement in the ground. The root systems on our plants are bigger, and on our soybeans there are more nodules, and they're healthier looking," he says. "The first year, when we went out to dig plants up to check, the first thing we noticed was that on the check strip with nothing, we had to stand on the shovel to get it to go in the ground, whereas, where we put these treatments on, you could push it in by hand. There's definitely something in the soil biology that's creating a healthier soil."

Edwards uses different Stoller biostimulant and micronutrient products on all his crops and says he has noticed improvements in crop quality — for example higher protein in his soybeans even in a low protein year like 2017 — and an increase in crop yields across the board.

Earlier, even crop emergence

With his farm located in pothole country, Edwards has a lot of rolling land, and says biostimulants have also helped him to achieve earlier, even emergence and a more even maturing crop all the way through to harvest. "Almost the whole field will emerge on the same day whereas before the warmer hilltops might emerge before the sloughs," he says. "Last year, when it was drier, on our canola and even our wheat, the whole field was flowering a lot more even rather than the high spots flowering first and the low spots flowering three to five days later. It makes it a lot more efficient to harvest, especially when we're trying to straight cut canola. It's much easier to cut the whole field rather than take the dry spots off the top and go back for the low spots later, it's all ready at the same time now."

In terms of saving fertilizer, Edwards is growing more yield with the same amount of nitrogen that he was using before, but he's using more phosphorus because with higher-yielding crops he has a higher removal rate. "That's just a product of growing more crop, you need more P, but we are using the same 100lbs/acre of N which is growing us another five to six bushels on average across the farm," he says.

Return on investment

Edwards admits that the biostimulant and micronutrient products he uses are an added cost but he looks at the overall return on investment on the whole farm. "We look at, not so much the cost per acre of the product going on, but what we'll get back out of it. If I'm going to put on a \$3 product on and get \$6 out of it or put a \$10 product on and get \$50 out of it, I'll trial them side-by-side and I'll take the \$10 one all day," he says.

Overall, Edwards is convinced that the improvements in soil and plant health that he gets with biostimulants are paying dividends for his farm. "Last year being as dry as it was, with that better root growth right off the bat, I think that really carried us through," he says. "We grew all our crops on an inch-and-a-half of rain last year and had the best canola yield we've had in a long time."

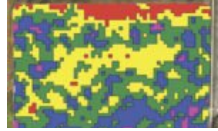
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